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INFORMATION DISTRIBUTION SYSTEM

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Field of the Invention

This application is a continuation in part of application Serial No. 08/939,368 filed September 29, 1997, ^{now 6,021,307} which is a continuation in part of application Serial No. 08/644,838 filed May 10, 1996, now abandoned, which is a continuation in part of application Serial No. 08/279,424 filed July 25, 1994, now abandoned, and application Serial No. 08/255,649 filed June 8, 1994, now abandoned. These four patent applications are incorporated herein by reference.

This invention relates generally to information distribution, and more particularly to distributing information using a broadcast channel and a bi-directional communication channel.

Background of the Invention

Recent advancements in modem and computer technology allow large amount of digital data to be transmitted electronically. A number of information providers (such as newspaper and magazine publishers) and on-line information distributors

1 have formed partnerships to deliver newspaper and other information on-line. In this
2 system, a subscriber uses a computer and a modem to connect, through a regular
3 phone line, to the computer of an on-line information provider. The subscriber can
4 retrieve information, including newspaper articles, stored in the computer of the
5 information provider.

6 On-line delivery of newspaper has many advantages. For example, the
7 information can be updated throughout the day while the printed version is printed
8 only once or twice a day. Further, it is possible to do text-based searches on the
9 information. However, it is found that on-line deliver of newspaper and other
10 information is slow. For example, a subscriber has to wait many seconds for a
11 newspaper article to be delivered. The quality of the electronic newspaper is low.
12 For example, in order to reduce storage and communication requirements, graphic
13 images appeared in the printed version are not universally supplied in the on-line
14 version of newspaper. One of the reasons for such poor performance is the limited
15 bandwidth of communication channels used by on-line information distributors.
16 Another reason is that information is centrally processed by the computer at the site
17 of the information distributor, with the result that each subscriber only gets a small
18 slice of the time of the computer.

19 20 **Summary of the Invention**

21 The present invention uses two channels to deliver digital information: a
22 broadcast channel and a bi-directional channel. The broadcast channel is used to

1 deliver the bulk of the digital information to subscribers. The amount of
2 information delivered is preferably sufficient to satisfy the needs of a large number of
3 subscribers so that they do not have to obtain additional information using the bi-
4 directional channel. The broadcasted information is stored on fast storage media
5 located at subscriber sites. As a result, search and retrieval of the broadcasted
6 information is quick. Further, the broadcasted information is processed locally using
7 a dedicated on-site processor instead of relying on the computers of the information
8 distributors. As a result, the load on the computers of the information distributors is
9 reduced. If the subscribers desire to receive additional information relating to the
10 broadcasted information, the bi-directional communication channel is used to
11 transmit the request and the requested information.

12 The distribution costs of broadcast channels are typically much lower than
13 that of a bi-directional communication channel. Consequently, the major portion of
14 information is delivered using low cost distribution channels. For a large number of
15 subscribers, the broadcasted information will provide all the information they
16 normally need. Thus, expensive bi-directional communication channels are used only
17 occasionally.

18 These and other features and advantages of the present invention will be fully
19 understood by referring to the following detailed description in conjunction with the
20 accompanying drawings.

21

1 **Brief Description of the Drawings**

2 Fig. 1 is a schematic drawing showing an information distribution system of
3 the present invention.

4 Fig. 2A shows a newspaper article as displayed on a monitor of the
5 information distribution system shown in Fig. 1.

6 Fig. 2B shows the contents of the broadcast information that corresponds to
7 the newspaper article of Fig. 2A.

8 Fig. 3 shows another embodiment of the information distribution system of
9 the present invention.

10 Fig. 4 is a schematic drawing showing another information distribution
11 system of the present invention.

12
13 **Detailed Description of the Invention**

14 Fig. 1 is a block diagram of an information distribution system 100 in
15 accordance with the present invention. In this embodiment, system 100 is designed
16 to electronically distribute newspaper. It should be pointed out that system 100 can
17 also be used advantageously to distribute other types of information. System 100
18 contains a plurality of subscriber units (such as units 102 and 104) each connected to a
19 bi-directional communication channel (e.g., telephone connections 106 and 108
20 coupled to units 102 and 104, respectively) and a satellite transponder 110 for
21 broadcasting digital data to these subscriber units. Telephone connections 106 and
22 108 (which could be line-based or wireless) are coupled to a central database 109. In

1 system 100, satellite transponder 110 is used to broadcast the content of a newspaper
2 to the subscriber units while telephone connections 106 and 108 are used to provide
3 additional information (stored in central database 109) to subscriber units 102 and
4 104, respectively, on a demand basis.

5 The structures of these subscriber units are substantially identical;
6 consequently, only one of these units, such as unit 102, is described in detail. Unit
7 102 contains an antenna 116 for receiving broadcast signals from satellite transponder
8 110, a signal/data processor 118 for performing signal and data processing functions, a
9 monitor 120 for displaying the electronic newspaper, and an input device 122 (such as
10 a keyboard and/or a mouse).

11 Signal/data processor 118 contains a transponder interface 132 for processing
12 transponder signal received from antenna 116. Transponder interface 132 typically
13 contains a low noise receiver for receiving high frequency (e.g., C or Ku band)
14 transponder signal and a "universal data interface" for converting the transponder
15 signal to digital data. The retrieved data is stored in nonvolatile storage 134, such as a
16 hard disk or solid state flash memory. Preferably, satellite transponder 110
17 broadcasts the newspaper data at predetermined times. Thus, a real-time clock 136 is
18 preferably used to turn on interface 132 at the predetermined times. Processor 118
19 contains a microcomputer 140 that coordinates the operation of clock 136,
20 nonvolatile storage 134, and interface 132. Processor 118 also contains a
21 communication interface 142 for sending and receiving digital data from central
22 database 109 through telephone connection 106.

1 The time for broadcast is preferably chosen when communication load of
2 transponder 110 is at a low level (e.g., around mid-night). As a result, the cost of
3 information delivery is low. Alternatively, the time of broadcasting is chosen by
4 transponder 110 because it knows when communication load is light. In this case,
5 transponder 110 first sends a signal to signal/data processor 118 for alerting processor
6 118 to receive and process the newspaper information.

7 A user can use the input device 122 and monitor 120 to read the content of the
8 electronic newspaper stored in nonvolatile storage 134. In this embodiment, the
9 complete content of the newspaper is stored in nonvolatile storage 134. The term
10 "complete content" means that the user is able to read the newspaper without relying
11 on information stored in central database 109 (although other embodiments may
12 deliver less than the complete content). In this aspect, system 100 functions in a
13 similar way as the distribution of a conventional printed newspaper. However, the
14 digital data of the electronic newspaper delivered by satellite transponder 110
15 preferably contains linkage reference that allows fast retrieval of additional
16 information from central database 109.

17 If the newspaper information received from satellite transponder 110 is
18 sufficient to satisfy the needs of a user, signal/data processor 118 will not activate
19 telephone connection 106. However, if the user wishes to receive additional
20 information relating to an item mentioned in the electronic newspaper (e.g., by
21 selecting at the item using the input device), process 118 will retrieve the information
22 stored in central database 109 using the embedded linkage reference.

1 In system 100 of the present invention, the complete content of the electronic
2 newspaper (including graphics and other multimedia contents, if delivered) is stored
3 in nonvolatile storage 134, which has fast access time. Further, a dedicated processor
4 (i.e., microcomputer 140) is used to process newspaper information. On the other
5 hand, prior art on-line newspaper distribution systems rely on modem to deliver the
6 content of the newspaper stored in a central site. Further, the processor in the central
7 site has to serve many users in delivering the newspaper. As a result, system 100 has
8 superior performance compared to the prior art on-line newspaper delivery systems.

9 If it is desirable to limit circulation of the newspaper to a certain class of
10 subscribers only (e.g., paid subscribers), the data transmitted by transponder 110
11 could be encrypted. As a result, only subscribers who have a decryption key are able
12 to read the newspaper. In the case, microcomputer 140 also performs decryption
13 functions.

14 Fig. 2A shows an example of a portion of a newspaper article as seen on
15 monitor 120. In Fig. 2A, the terms that a user may obtain additional information are
16 underlined (or highlighted in other ways, such as setting in different colors,
17 depending on the choice of the publisher). If desired, the user may select these terms
18 using a pointing device, such as a mouse, and signal/data processor 118 will obtain
19 the additional information from central database 109.

20 Fig. 2B shows the same portion in Fig. 2A as transmitted by transponder 110
21 (for simplicity, the embedded formatting codes, such as center, bold, etc., are not
22 shown). Each of the terms underlined in Fig. 2A are enclosed by a special symbol

1 (e.g., the "Y" symbol) and followed by a linkage reference enclosed by another
2 special symbol (e.g., the "Z" symbol). These symbols are invisible to the users and
3 are recognizable only by microcomputer 140.

4 When an underlined term in Fig. 2A is selected by a user, microcomputer 140
5 extracts the linkage reference and transmits it to central database 109. The linkage
6 reference allows central database 109 to retrieve the necessary information quickly
7 without doing extensive searches. As a result, the response time of system 100 is fast.
8 The retrieved information can itself contains linkage references and can be searched.

9 If the speed of searching and retrieving data by central database 109 is fast, it
10 may not be necessary to include linkage reference in the information broadcasted by
11 transponder 110. In this case, the user selects (e.g., using the mouse) words and terms
12 he/she is interested in. Signal/data processor 118 transmits the selected items to
13 central database 109, which searches for matches in its database. Matched
14 information is sent to subscriber unit 102 for processing.

15 The bi-directional channel also allows updating of the broadcasted
16 information. There is typically a time difference between the broadcast and display of
17 information. New information gathered during this time difference can be stored in
18 central database 109 and later transmitted to signal/data processor 118.

19 In this embodiment of the present invention, satellite transponder 110 is used
20 as the vehicle to electronically broadcast newspaper. However, other broadcast
21 distribution methods can be used. In the present invention, broadcast is defined as
22 one-to-many distribution of information. The broadcast distribution channels do not

1 have to be electrical. For example, the present invention allows the distribution of
2 compact disc read-only memories (CDROMs) encoded with digital information to
3 the subscriber sites. In the case of electrical broadcast communication channels, both
4 wired and wireless can be used. Preferably, unidirectional channels are used for
5 broadcast because of their low cost; however, the present invention does not preclude
6 the use of bi-directional communication channels (such as telephone lines) as means
7 for distributing broadcast (i.e., one to many) information.

8 Fig. 4 is a schematic diagram of another information distribution system of
9 the present invention. Similar elements in Figs. 1 and 4 have the same reference
10 numerals. In Fig. 4, a plurality of CDs (such as CDs 152 and 154) encoded with the
11 above described information are distributed to subscriber units 102 and 104. Instead
12 of antennas and transponder interfaces, subscriber units 102 and 104 contains CD
13 readers (such as CD reader 156).

14 Current technology allows the size of antenna 116 to be as small as 2 feet.
15 The costs of antenna 116 and transponder interface 132 are already low enough to be
16 within the reach of small business or a typical household. The newspaper publisher
17 has to pay for the use of the transponder. However, the costs are comparable to the
18 printing and distribution costs of printed newspaper. It is anticipated that the costs
19 of the newspaper distribution system in accordance with the present invention will
20 be lowered as the number of subscribers increases.

21 Fig. 3 shows another embodiment of a newspaper distribution system 200 of
22 the present invention. System 200 contains a satellite transponder 210, an earth

1 station 214, and a plurality of subscriber units, such as units 222 and 224.
 2 Transponder 210 functions in a similar way as transponder 110 of Fig. 1 and
 3 subscriber units 222 and 224 function in a similar way as subscriber units 102 and 104
 4 of Fig. 1. Earth station 214 receives digital data transmitted by transponder 210 using
 5 an antenna 216. The data is distributed to subscriber units 222 and 224 via wired
 6 communication channel 228, such as cable and optic fiber. Other earth stations could
 7 be placed in strategic locations throughout the country to serve their respective
 8 subscribers in a similar manner as earth station 214 and subscriber units 222 and 224.
 9 As a result, a large geographic area can be served simultaneously by satellite
 10 transponder 210. The advantage of this embodiment is that the equipment costs
 11 incurred by the subscriber units are low.

12 In some locations, it may not be desirable to use wired communication
 13 channel to link an earth station to subscribers. In such case, wireless communication
 14 channel could be used. Fig. 3 shows an earth station 234 that receives transponder
 15 signal from transponder 210 using an antenna 236. Earth station 234 in turn
 16 broadcasts the digital data to its subscribers, such as subscriber units 242 and 244.

17 In one embodiment of system 200, teletext technology is used to link earth
 18 station 234 and subscriber units 242 and 244. Thus, earth station 234 could be
 19 located adjacent to a television transmission station. The digital data received by
 20 earth station 234 can be integrated to the vertical blanking interval of a TV signal,
 21 which is broadcasted using an antenna 238. Subscriber units 242 and 244 receive the
 22 signal using antennas 239, and 240, respectively. The digital data is then retrieved.

1 Various improvements and refinements of the teletext technology are well known
2 and can be incorporated into system 200.

3 It should be obvious to a person skilled in the art that systems 100 and 200 are
4 not limited to the distribution of newspaper. Further, electronic newspapers of the
5 future may contains contents which are not available in the printed version, such as
6 video and other multimedia compositions. Other information, such as magazines,
7 graphic images, electronic mails, computer games, multimedia work, or interactive
8 movie, could also be advantageously distribution using a system similar to systems
9 100 and 200. For example, if it is desirable to distribute interactive movie, the non-
10 interactive portion can be broadcasted while the interactive portion is delivered using
11 a bi-directional channel.

12 There has thus shown and described a novel information distribution system.
13 Many changes, modifications, variations and other uses and applications of the subject
14 invention will become apparent to those skilled in the art after considering this
15 specification and the accompanying drawings. All such changes, modifications,
16 variations, uses, and applications are covered by the scope of this invention which is
17 limited only by the appended claims.

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